Meningococcal Infection (Invasive)

REPORT IMMEDIATELY

(Including Meningitis, Meningococcemia, Pneumonia, and other invasive infections)

Note: This chapter focuses only on invasive infections caused by Neisseria meningitidis. For information about other causes of meningitis, please refer to the chapters entitled "Meningitis, Viral ("Aseptic")" and "Meningitis, General (Multiple Etiologies)"

Section 1:

ABOUT THE DISEASE

A. Etiologic Agent

Invasive meningococcal infections are caused by the bacterium *Neisseria meningitidis* (the meningococcus), a gram-negative diplococcus. There are 13 serogroups of *N. meningitidis*; 9 of these serogroups (A, B, C1+, C1-, L, X, Y, W-135, and Z) are known to cause invasive disease in humans.

B. Clinical Description

Invasive infection with *N. meningitidis* may cause several clinical syndromes, including meningitis, bacteremia, sepsis, and pneumonia. Symptoms of meningitis (infection of the meninges: the membrane covering the central nervous system) typically include the sudden onset of stiff neck, high fever, and headache. A rash may be present. Nausea, vomiting, and mental confusion are often present as well. Meningococcemia (infection of the blood) typically presents with the abrupt onset of fever, chills, malaise, prostration, and rash (urticarial [hives], maculopapular [spots and bumps], purpuric [bruises], or petechial ["flea bites"]). Fulminant disease presents with purpura (bleeding into the skin), abnormal blood clotting, shock, and/or coma, and may lead to death within hours despite appropriate therapy. The case-fatality rate for meningococcal meningitis and meningococcemia is about 10–15%, even with appropriate antibiotic treatment. Persons with immune compromise due to terminal complement component deficiency are prone to recurrent disease, and persons without a functioning spleen are more susceptible to bacteremic illness.

C. Vectors and Reservoirs

Humans are the only known reservoir of *N. meningitidis*.

D. Modes of Transmission

The principal mode of transmission of *N. meningitidis* is person-to-person spread through direct contact with oral or nasal secretions. The bacteria may also be spread through droplets or via an inanimate object contaminated with saliva (e.g., cigarettes or water bottles).

E. Incubation Period

The incubation period is usually 2–4 days, but it can range from 1–10 days.

F. Period of Communicability or Infectious Period

Cases remain infectious as long as meningococci are present in their oral secretions. Meningococci usually disappear from the nasopharynx within 24 hours after initiation of effective antibiotic treatment.

G. Epidemiology

Sporadic cases and occasional outbreaks of invasive meningococcal disease occur worldwide. A "meningitis belt" extends from sub-Saharan Africa into India/Nepal, and invasive meningococcal disease due to *N. meningitidis* serogroup A is considered endemic in these areas. Epidemics of meningococcal meningitis also occur in this meningitis belt every 8–12 years and last from 2–4 years. Seasonal variations occur in these epidemics, with peaks of illness usually occurring in the dry, hot season. The prevalent serotypes of *N. meningitidis* vary over time and by geography.

In the U.S., the largest number of cases of invasive meningococcal disease usually occur during the winter and early spring, coincident with an increase in the occurrence of acute respiratory infections. Historically in the U.S., cases of invasive meningococcal disease were most commonly seen in children under five years of age. However, the age distribution has shifted to an older population. The peak incidence groups continue to include young children (under age five), but cases in adolescents and young adults have increased, and the elderly are also at risk. Meningococcal pneumonia is more commonly seen in older patients. In the U.S., outbreaks of invasive meningococcal disease occur most frequently in crowded conditions (e.g., military bases, college dormitories). Cases of invasive meningococcal disease in the U.S. are most often caused by serogroups B, C, and Y (each accounting for approximately 30% of reported cases), although other serogroups are seen sporadically. Epidemics of invasive disease are most commonly associated with serogroups C and Y.

Meningococcal Carriage

N. meningitidis typically colonizes the nose and the throat of 5–15% of the general population at any given time. These carriers are generally asymptomatic, and carriage of the bacteria may act as an immunizing exposure, protecting the carrier from future infections by that particular strain. Carriers act as vectors, spreading the bacteria to others through saliva and respiratory secretions. As contacts of cases with invasive disease are at most risk, the contacts of cases and not contacts of carriers are prophylaxed.

H. Bioterrorist Potential

This pathogen is not considered to be of risk for use in bioterrorism.

Section 2: REPORTING CRITERIA AND LABORATORY TESTING

A. What to Report to the Massachusetts Department of Public Health (MDPH)

Report any suspect case based on a health care provider's impression (acute severe illness associated with signs of meningitis and/or purpuric rash) or a laboratory result indicating *N. meningitidis* (such as gram-negative diplococci

in a sterile body site; the isolation of *N. meningitidis* from a sterile body site; or evidence of *N. meningitidis* DNA using PCR, obtained from a normally sterile site).

Isolates obtained from sputum or throat cultures are not considered to come from sterile sites; therefore *N. meningitidis* from these sites is in itself not indicative of invasive disease. If a patient with culture-positive sputum has an illness compatible with invasive meningococcal disease, clinical evaluation and culture of appropriate sterile sites are needed.

Note: See Section 3C for information on how to report a case.

B. Laboratory Testing Services Available

The MDPH State Laboratory Institute (SLI), Reference Laboratory will perform confirmatory testing and serogrouping for isolates of *N. meningitidis.* In addition, the SLI Reference Laboratory requests submission of all *N. meningitidis* isolates from normally sterile sites for serogrouping, since serogroup data are important for disease surveillance. The SLI Reference Laboratory will also isolate the organism from appropriate clinical samples when specimens are submitted as part of an epidemiologic investigation conducted by the MDPH.

Contact the SLI Reference Laboratory at (617) 983-6607 for additional information on submission of specimens.

Section 3:
REPORTING RESPONSIBILITIES AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To identify close contacts of the case and to provide recommendations for appropriate preventive measures for close contacts, so as to prevent further spread of infection and disease.
- To provide information about the disease, its transmission, and methods of prevention.
- To identify clusters or outbreaks of infection, and to initiate appropriate prevention and control measures.

B. Laboratory and Health Care Provider Reporting Requirements

Invasive meningococcal infection is reportable to the local board of health (LBOH). The MDPH requests that health care providers immediately report to the LBOH in the community where the case is diagnosed, all confirmed or suspect cases of invasive meningococcal infection, as defined by the reporting criteria in Section 2A.

Laboratories performing examinations on any specimens derived from Massachusetts residents that yield evidence of *N. meningitidis* infection shall immediately report such evidence of infection, directly by phone, to the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850.

C. Local Board of Health (LBOH) Reporting and Follow-Up Responsibilities

Reporting Requirements

MDPH regulations *(105 CMR 300.000)* stipulate that invasive meningococcal infection is reportable to the LBOH and that each LBOH must report any case of invasive meningococcal infection or suspect case of invasive meningococcal infection, as defined by the reporting criteria in Section 2A. Cases should be reported to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS) using a MDPH *Invasive Meningococcal Disease Case Report Form* (found at the end of this chapter). Refer to the *Local Board of Health Timeline* at the end of this manual's *Introduction* section for information on prioritization and timeliness requirements of reporting and case investigation.

Case Investigation

Please report suspect or confirmed cases of invasive meningococcal disease immediately to the MDPH Division of Epidemiology and Immunization by calling (617) 983-6800 or (888) 658-2850, 24 hours a day, 7 days a week.

1. After notification of the MDPH Division of Epidemiology and Immunization, it is the responsibility of the LBOH to complete a MDPH *Invasive Meningococcal Disease Case Report Form* (found at the end of this chapter) by interviewing the case and/or others who may be able to provide pertinent information. The MDPH Division of Epidemiology and Immunization staff is available 24 hours a day, 7 days a week, to assist in the follow-up of a case of invasive meningococcal infection.
2. When investigating a case of invasive meningococcal disease, focus on preventing additional cases of disease in contacts of the case. The *Suspect Invasive Meningococcal Disease Intake Form* (found at the end of this chapter) will assist you in collecting the appropriate information for complete contact identification and referral. Use this intake form to collect case information that may then be transcribed onto the MDPH *Invasive Meningococcal Disease Case Report Form.*

   Note: This intake form does not replace the MDPH Meningococcal Disease Case Report Form, but was designed to assist with data collection and case investigation.
3. The first step in investigating a case of invasive meningococcal infection is to confirm the diagnosis. Often, reported cases of "meningitis" are ultimately found to be caused by agents other than *N. meningitidis.* All cases of meningitis need to be reported to the MDPH. However, when *N. meningitidis* is suspected or confirmed, certain public health actions need to be taken to protect contacts from developing disease.
4. Use the following guidelines to assist in completing the *Suspect Invasive Meningococcal Disease Intake Form*:
   a. Accurately record the demographic information, collecting as much information about the case as possible, including address, place of work, occupation, and daycare or school information.
   b. If the case is hospitalized, collect hospital and transfer hospital information, if applicable. Hospital laboratories and infection control practitioners are key in obtaining the appropriate information for confirming a diagnosis.
   c. Collect clinical information on the case, including laboratory data, clinical manifestation, and onset date information. This information is best collected from the infection control practitioner at the hospital or from the health care provider.

d. Collect as much information as possible about the case's activities and contacts during the 14 days prior to disease notification. This information may be obtained from the case, family and friends, school or daycare personnel, or others involved with the case. Those who meet the definition of a close contact (see Section 4B) of a case of invasive meningococcal disease must be referred to their health care providers for appropriate antibiotic therapy. Sample letters for notifying contacts in a school, daycare, or workplace are available from the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850.

5. Use the following guidelines to assist in completing the MDPH *Invasive Meningococcal Disease Case Report Form*:

   a. If you completed the *Suspect Invasive Meningococcal Disease Intake Form*, most information for the case report form will have been collected and may be transcribed. Make sure to record all demographic information. Record information relevant to hospitalization (if applicable), and include symptom history and onset date.

   b. Indicate the type of infection caused by *N. meningitidis*.

   c. If the case is ≤7 years of age, indicate if the case had cochlear implants.

   d. Indicate the type of specimen from which *N. meningitidis* was isolated/identified.

   e. Indicate if *N. meningitidis* was culture-confirmed or indicate other tests performed (e.g., bacterial antigen screen). Also indicate the date the specimen was collected for the first positive culture.

   f. If known, indicate the serotype of *N. meningitidis* and antibiotic resistance information.

   g. If the case attends daycare or school, list the daycare/school name, and provide a contact name and phone number.

   h. If the case attends college, indicate the name of the college, the case's year in school, and the case's living situation.

   i. If the case has received meningococcal vaccine, indicate type of vaccine, date administered, and reason for administration.

   j. If you have made several attempts to obtain case information but have been unsuccessful (e.g., the case or health care provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as you have gathered. Please note on the form the reason(s) why it could not be filled out completely.

6. After completing the form, attach laboratory report(s) and fax or mail (in an envelope marked "Confidential") to ISIS. The confidential fax number is (617) 983-6813. Call ISIS at (617) 983-6801 to confirm receipt of your fax. The mailing address is:

MDPH, Office of Integrated Surveillance and Informatics Services (ISIS)
305 South Street, 5th Floor
Jamaica Plain, MA 02130
Fax: (617) 983-6813

7. Institution of disease control measures is an integral part of case investigation. It is the responsibility of the LBOH to understand, and if necessary, institute the control guidelines listed in Section 4.

Section 4:

CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements *(105 CMR 300.200)*

Minimum Period of Isolation of Patient

Until 24 hours after the initiation of appropriate antibiotic therapy.

Minimum Period of Quarantine of Contacts

Personal surveillance and antibiotic prophylaxis, where appropriate.

B. Protection of Contacts of a Case

Prophylaxis

Close contacts of the case should be identified and referred to their health care providers for antibiotic prophylaxis. A close contact is defined as any member of the case's household or other individual who may have had intimate contact with the case's saliva and/or oral/nasal secretions. Health care workers who have intimate contact with the case's oral/nasal secretions (through unprotected mouth-to-mouth resuscitation, intubation, or suctioning) are also considered close contacts.

C. Managing Special Situations

Daycare

A case of invasive meningococcal illness in a daycare setting often causes panic in parents and in the community. Although the risk of transmission in this setting is relatively low, chemoprophylaxis for all the children in the daycare class or the daycare facility may be recommended because the interactions between young children are often very close. Surveillance for additional cases of disease should also be heightened. Contact the MDPH Division of Epidemiology and Immunization to report suspect or confirmed cases in a daycare (or any other setting). An epidemiologist will work with LBOH to ensure all contacts are identified and notified. In addition, surveillance for new cases of disease should continue at the facility for at least two weeks after the onset of the first case. If multiple cases occur, surveillance should continue for two weeks after the onset of the last case.

School

A case of invasive meningococcal illness in a school often causes panic in parents and in the community. Although the risk of transmission in a school is relatively low, the age of the case will determine the extent of chemoprophylaxis necessary. Because the interactions between young children are often very close, chemoprophylaxis for all the children in the case's class may be recommended if the child is in early elementary school. A high school or college student, on the other hand, usually has a more defined group of close contacts, and chemoprophylaxis may be more targeted. The MDPH *Comprehensive School Health Manual* provides detailed recommendations for investigating a case of invasive meningococcal disease in a school. Surveillance for additional cases of disease should also be heightened. In addition, contact the MDPH Division of Epidemiology and Immunization to report suspect or confirmed cases in a school (or any other setting). An epidemiologist will work with you to ensure all contacts are identified and notified. In addition, surveillance for new cases of disease should continue at the school for at least two weeks after the onset of the first case. If multiple cases occur, surveillance should continue for two weeks after the onset of the last case.

Community Residential Program

If a case of meningococcal disease occurs in a residential program, close contacts of the case should be referred to their health care providers for chemoprophylaxis. Activity in the facility should be assessed to determine the level of interaction between residents. The facility may be considered a household setting and may require chemoprophylaxis of all residents, or the chemoprophylaxis may be more targeted. Contact the MDPH Division of Epidemiology and Immunization for assistance in following up on a case of invasive meningococcal disease in residential programs. In addition, surveillance for new cases of disease in the facility should continue for at least two weeks after the onset of the first case. If multiple cases occur, surveillance should continue for two weeks after the onset of the last case.

Reported Incidence Is Higher Than Usual/Outbreak Suspected

If the number of reported cases in your city/town is higher than usual for the time of year or if you suspect an outbreak, please contact the MDPH Division of Epidemiology and Immunization immediately, at (617) 983-6800 or (888) 658-2850. This situation may warrant an investigation of clustered cases to determine a course of action to prevent further cases. The MDPH can perform surveillance for clusters of illness across town lines, which would otherwise be difficult to identify at the local level.

D. Preventive Measures

Personal Preventive Measures/Education

To prevent additional cases:

- Refer close contacts to health care providers for appropriate chemoprophylaxis.
- Advise contacts of signs and symptoms of illness, and refer them to their health care providers should they experience any symptoms compatible with invasive meningococcal disease.
- Provide close contacts with a Meningococcal Disease Public Health Fact Sheet, which is available from the MDPH Division of Epidemiology and Immunization or on the MDPH website at www.mass.gov/dph. Click on the "Publications and Statistics" link, and select the "Public Health Fact Sheets" section under "Communicable Disease Control."

To avoid future exposures, advise individuals to:

- Practice good hand hygiene and handwashing.
- Avoid sharing food, beverages, cigarettes, or eating utensils.
- Consider immunization in certain circumstances (see below).

Immunization

There are currently 2 vaccines (polysaccharide and conjugate) available in the U.S. that protect against the 4 most common serogroups of the 13 serogroups (subgroups) of *N. meningitidis* that cause serious disease. Protection with the meningococcal polysaccharide vaccine lasts about 3–5 years. The meningococcal conjugate vaccine is expected to help decrease disease transmission and to provide more long-term protection.

Meningococcal vaccine is now recommended for children 11–12 years of age, for adolescents at high school entry (15 years of age), and college freshmen and other newly enrolled students living in dormitories. Other high-risk groups include anyone with a damaged spleen or whose spleen has been removed, those traveling to countries where meningococcal disease is very common, and people who may have been exposed to meningococcal disease during an outbreak. Children and adults with an inherited immune disorder (called "terminal complement component

deficiency") should also receive the vaccine. Children and adults with HIV infection may also be at increased risk. Parents of children in these groups should discuss vaccination with their child's health care provider.

In Massachusetts, beginning in August 2005, schools (e.g., boarding schools) and secondary schools (e.g., colleges) that provide or license residential housing must require new students to provide documentation of having received meningococcal vaccine, or the student (or guardian) must sign a waiver declining vaccination. More information about this requirement may be found in the MDPH document, *Information about Meningococcal Disease and Vaccination and Waiver for Students at Colleges and Secondary Schools*. This document, as well as others pertaining to invasive meningococcal disease and the vaccine, can be found on the MDPH website at www.mass.gov/dph.

ADDITIONAL INFORMATION

The following is the formal Centers for Disease Control and Prevention (CDC) case definition for invasive meningococcal disease. It is provided for your information only and should not affect the investigation and reporting of a case that fulfills the criteria in Section 2A. (CDC case definitions are used by the MDPH and the CDC to maintain uniform national reporting standards.) For reporting to the MDPH, always use the criteria outlined in Section 2A.

Note: The most up-to-date CDC case definitions are available on the CDC website at www.cdc.gov/epo/dphsi/casedef/case_definitions.htm.

Clinical Description

Meningococcal disease manifests most commonly as meningitis and/or meningococcemia that may progress rapidly to purpura fulminans, shock, and death. However, other manifestations might be observed.

Laboratory Criteria for Diagnosis

Isolation of *N. meningitidis* from a normally sterile site (e.g., blood or cerebrospinal fluid [CSF], or less commonly, joint, pleural, or pericardial fluid).

Case Classification

Suspect	◆ Clinical purpura fulminans in the absence of a positive blood culture. ◆ A clinically-compatible case with gram negative diplococci from a normally sterile site (e.g., blood or CSF).
Probable	A clinically-compatible case that has either: ◆ Evidence of *N. meningitidis* DNA using PCR, obtained from a normally sterile site (e.g., blood or CSF); or ◆ Evidence of *N. meningitidis* antigen by immunohistochemistry (IHC) or formalin-fixed tissue or latex agglutination of CSF.

Confirmed	A clinically-compatible case AND isolation of *N. meningitidis* from a normally sterile site or from skin scrapings of purpuric lesions.

Comment

Positive antigen test results from urine or serum samples are unreliable for diagnosing meningococcal disease.

REFERENCES

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FORMS & WORKSHEETS

Meningococcal Infection (Invasive)

(Including Meningitis, Meningococcemia, Pneumonia, and other invasive Infections)

Meningococcal Infection (Invasive)

REPORT IMMEDIATELY

(Including Meningitis, Meningococcemia, Pneumonia, and other invasive infections)

LBOH Action Steps

This form does not need to be submitted to the MDPH with the case report form. It is for LBOH use and is meant as a quick-reference guide to invasive meningococcal infection case investigation activities.

LBOH staff should follow these steps when invasive meningococcal infection is suspected or confirmed in the community. For more detailed information, including disease epidemiology, reporting, case investigation, and follow-up, refer to the preceding chapter.

- ❑ Immediately notify the MDPH Division of Epidemiology and Immunization, at (617) 983-6800 or (888) 658-2850, to report any confirmed or suspect case(s) of invasive meningococcal infection.
- ❑ Complete a MDPH *Suspect Invasive Meningococcal Disease Intake Form.*
- ❑ Obtain laboratory confirmation.
- ❑ Work with MDPH to identify close contacts of the case, and refer them for appropriate prophylaxis.
- ❑ Institute appropriate isolation and quarantine requirements as they apply to a particular case.
- ❑ Fill out the case report form (attach laboratory results).
- ❑ Send the completed case report form (with laboratory results) to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS).